LocalScape Demographics Methodology

A major goal of LocalScape is to bring data together from disparate sources in order to provide new insights. With respect to assessments and demographics data, that is precisely what has occurred.

LocalScape interpolates demographics for areas that do not follow census tract boundaries, including neighborhoods, community alliances, hospital districts, fire districts, school districts, council districts, legislative districts, cities, potential annexation areas, levy codes, appraisal market areas, map-view-extent, and user-specified polygons. The method of accomplishing this interpolation combines in-depth assessments data with demographics data. This method of interpolation may be unique to King County.

DATA SOURCES

Data sources for LocalScape demographic estimates are the following:

- U.S. Census American Community Survey (ACS) 5-year – data source for median income, age, gender, and race.
- Washington State Office of Financial Management (OFM) - data source for population.
- King County Department of Assessments Parcel Data

EXAMPLE OF COMMONLY USED METHOD OF DEMOGRAPHICS INTERPOLATION

A common approach to areal interpolation of demographics data, when parcel polygons are available, is to use parcel point-weighted areal interpolation. An example follows*:
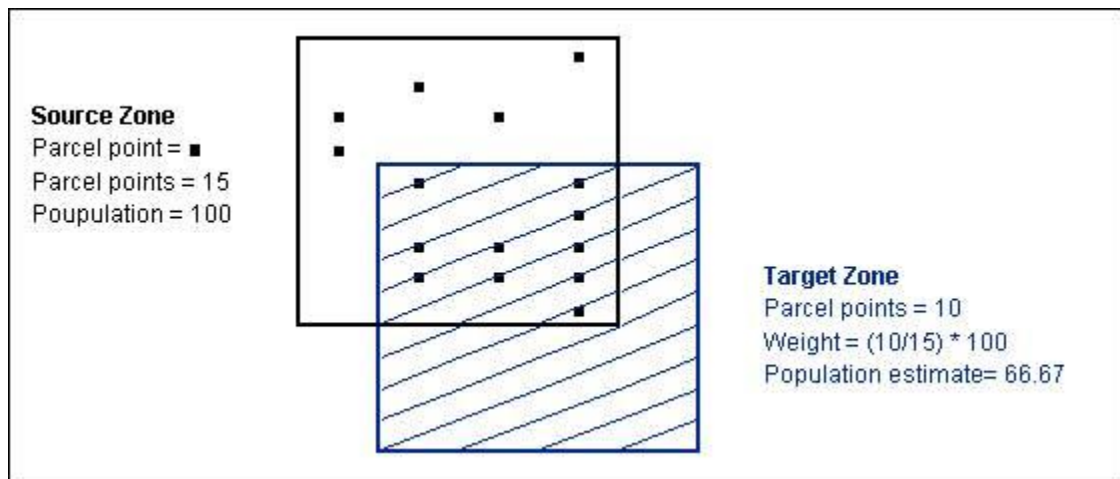
In the source zone, there are 100 people and 15 parcels, for a ratio of 6.666666667 people per parcel.

In the target zone there are 10 parcels.

The estimated population in the target zone is 10 parcels * 6. 666666667 people per parcel = 66.67 people.

* Source: http://www.ofm.wa.gov/pop/smallarea/docs/saep_user_guide.pdf

LOCALSCAPE METHOD OF DEMOGRAPHICS INTERPOLATION

LocalScape goes beyond parcel point interpolation by leveraging in-depth assessments data in addition to parcel polygon data.

This is illustrated in the following example, where different land uses are color coded on a GIS map:

Common sense says that there will not be many people living on the vacant land parcels or on the parcels with commercial buildings.   Similarly, more people occupy a parcel with a 100+ unit multifamily dwelling than a parcel with a single family residence.

There is mathematical support for these common-sense concepts.   Multiple regression analysis shows that, as more detailed housing data is analyzed along with the spatial distribution of parcels in King County, the predictive ability of the regression model improves*:

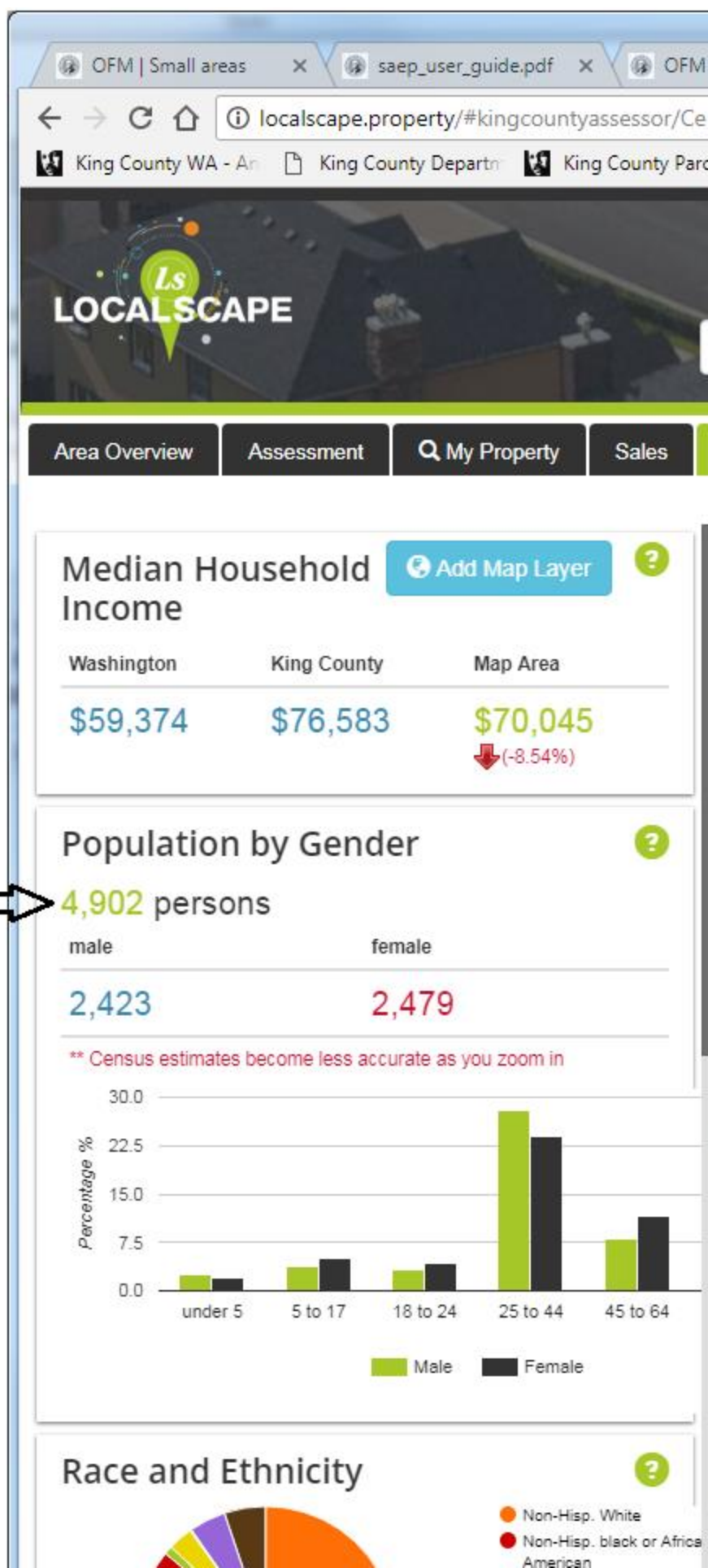| Model Number	Assessments Variable(s)	Adjusted R-Squared	*Percentage of Variation in Census Tract Population Explained by Variation in Housing Variables
1	Parcels	0.31	31%
2	Number of Housing Units per Parcel	0.59	59%
3	Number of Housing Units broken out by Apartment, Residential Condo Unit, House, Duplex, Triplex, Mobile Home.	0.79	79%
4	Number Bedrooms per Parcel.	0.79	79%
5	Number Bedrooms broken out by Apartment, Residential Condo Unit, House, Duplex, Triplex, Mobile Home.	0.89	89%

Table 1: R-Squared values for 2010 Census Tract populations, predicted using parcel and housing data.

The above results are directly applicable to interpolation of population and other demographic data in areas that do not follow census tract boundaries. The regression analysis can be used to estimate, on average, the population that a given type of parcel will have.

In LocalScape, we are currently using population data from Washington State Office of Financial Management Small Area Estimate Program (OFM-SAEP).   OFM annually adjusts 2010 Census data the population for births, deaths and migration.

When any Census Tract is selected in LocalScape, the results *exactly* match the OFM-SAEP data (Tract 005801 shown):

SAEP Version	Estimated Total Population 2015
September 8, 2015	4,902

localscape.property/#kingcountyassessor/Ce

King County WA - An   King County Departn   King County Parc

LOCALSCAPE

Area Overview   **Assessment**   **Q My Property**   **Sales**

Median Household Income   🌐 Add Map Layer

Washington	King County	Map Area
$59,374	$76,583	$70,045 ⬇(-8.54%)

Population by Gender

4,902 persons

male	female
2,423	2,479

** Census estimates become less accurate as you zoom in

Percentage % — chart: under 5, 5 to 17, 18 to 24, 25 to 44, 45 to 64

Legend: Male   Female

Race and Ethnicity

Non-Hisp. White
Non-Hisp. black or Africa
American

However, that exact match is not accomplished by simply referencing the singular statistic for total population in Tract 005801. Rather, it is accomplished by summing up all of the fractional populations on each parcel in the tract, allocated to each parcel per the results of Regression Model 5 in the table above. For example, Parcel 2770603030 is a 226 unit, 255 bedroom apartment building with 295.752134996807 people allocated to it. Parcel 9478110000 is an 84 unit, 108 bedroom residential condo complex with 47.9404471938232 people allocated to it. Parcel 2770600130 is a 3-bedroom single family residence with 2.08325627315567 people allocated to it. Vacant land and commercial parcels have no people allocated to them. It makes sense that the parcels with more dwelling units house more people than vacant parcels, etc., and the regression estimates provide a statistically valid mathematical method of quantifying those numbers.

Every parcel in King County has a fractional allocation applied to it, based upon which Census Tract it is in and upon the parcel itself. This allows efficient and accurate interpolation where the area-of-interest does not follow census tract boundaries. Fractional populations and fractional amounts of other demographics measures are simply summed up for the parcels involved. The Magnolia neighborhood is shown below:
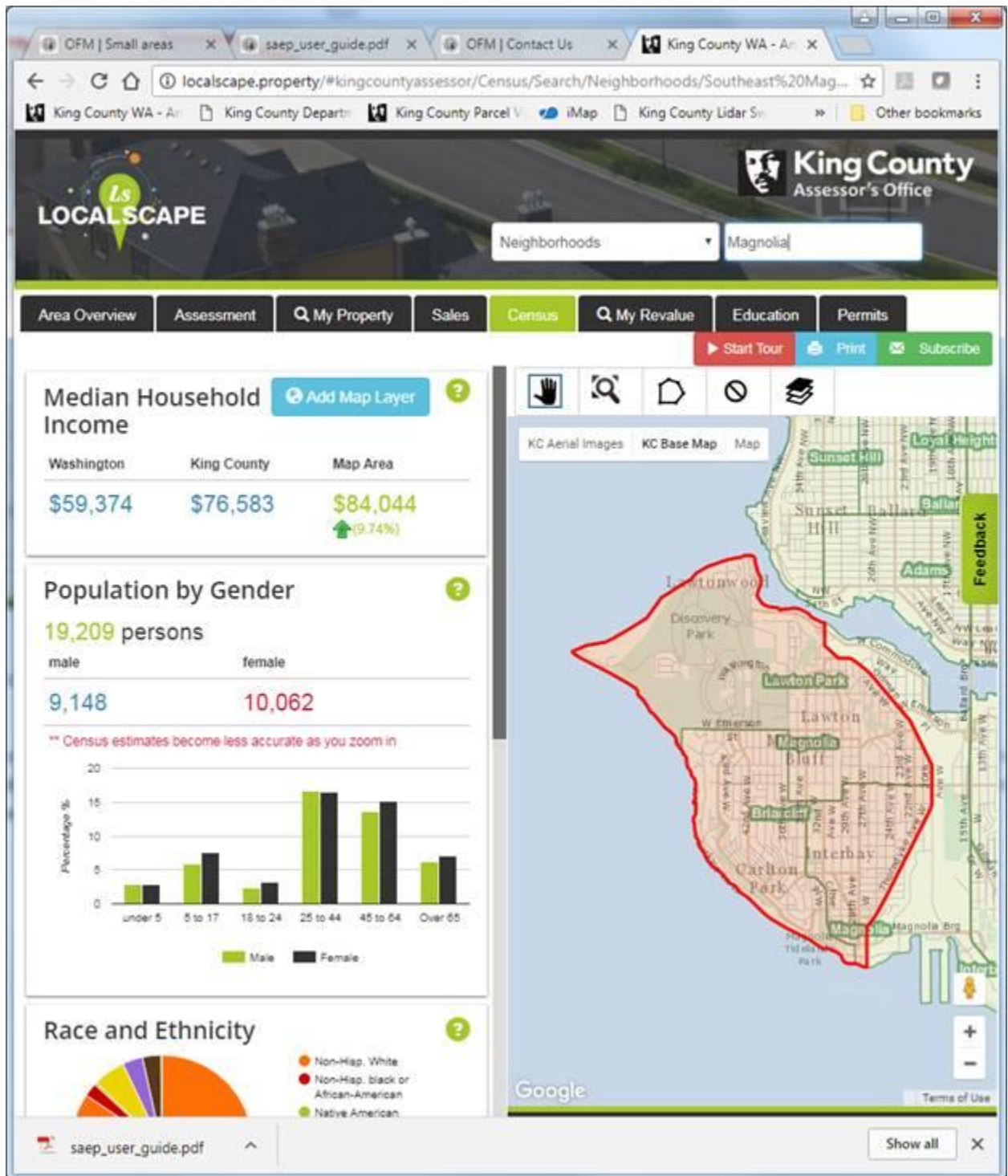
VALIDATION OF DEMOGRAPHICS-INTERPOLATION MODEL

The Demographics-Interpolation Model described above uses the statistical procedure Multiple Regression Analysis (MRA).

The following variables are used in the MRA interpolation model:

Variable Name	Variable Description
AptBedrooms	Count of Apartment Bedrooms on Parcel
ResCondoBedrooms	Count of Residential Condo Bedrooms on Parcel
ResBedrooms	Count of Residential Home Bedrooms on Parcel
FH_Bedrooms	Count of Floating Home Bedrooms on Parcel
MH_Count	Count of Mobile Homes on Parcel (bedroom counts not collected)

Table 2: Variables Used in MRA Interpolation Model.

Many statistical measures are available to validate MRA models. Adjusted R-Squared is the percentage of variation in census tract population explained by variation in housing variables.

Results below demonstrate that a high percentage of variation in the population is explained by the model. This is the case through several years of calibration with different Census and Assessments datasets:

Population Data Source	Adjusted R-Squared	Hypothesis Test Probability (P-Value)
2010 Decennial Census	0.8945	< 0.0001
2014 OFM-SAEP	0.9077	< 0.0001
2015 OFM-SAEP	0.9027	< 0.0001
2016 OFM-SAEP	0.9098	< 0.0001
2017 OFM-SAEP	0.9013	< 0.0001

Table 3: Adjusted R-Squared and Hypothesis Test Probability (P-Values) resulting from Demographics-Interpolation Model over several years of calibration.

Hypothesis-test thresholds are typically set at 0.05 in science and industry. A P-Value below .05 (i.e. 95% certainty) is typically interpreted as statistically significant. The very low P-Values in Table 3 above demonstrate that the models are *highly* statistically significant.

DATA STORAGE

The parcel and demographics data are stored in a King County Department of Assessments SQL Server Database table named "open_BasicData". A subset of the data fields and data values from the open_BasicData table are listed below. The example is from a parcel with an apartment building:

Parcel	2569830000
xCoord	1273776.838

yCoord	261829.8702
AddrLine	507 NE NORTHGATE WAY
StreetNbr	507
GEO_ID_TRT	53033001200
AptBedrooms	149.25
ResCondoBedrooms	0
ResBedrooms	0
MH_Count	0
FH_Bedrooms	0
ParcelPop	182.1728166
ParcelFractionOfTotalPop	0.025708935
TotMale	84.8479723
MaleU5	3.748303997
Male5_17	10.74688559
Male1824	8.702356133
Male2544	37.45682805
Male4564	15.15048748
Male65	9.043111042
TotFem	97.32484434
FemU5	8.151905896
Fem5_17	6.212224107
Fem1824	7.680091407
Fem2544	84.8479723
Fem4564	16.8018382
Fem65	20.31423495
White	106.7349222
BlackorAA	13.76125593
AmIndAlaNa	0
Asian	33.70852406
HaworPacIs	0
OtherRace	0

TwoPlusRac	9.436289783
HispLatino	18.53182466
ParcelEducNoHighSchool	17.81973762
ParcelEducHighSchool	21.02798783
ParcelEducSomeCollege	58.06235446
ParcelEducBachelors	51.92483231
ParcelEducAdvDegree	33.33790442
MedIncome	1427.225079
EnglishOnl	121.0652785
SpeakOther	61.10753809

For the above parcel, the estimated population is 182.1728166.

There are 84.8479723 males, 7.680091407 females from ages 45-64, 51.92483231 people with Bachelor's Degrees, etc.

Various demographics for a given region of the map are displayed by summing the values for individual data fields.

There are currently 710,272 records (parcels) in the table.